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SUPPLEMENTAL ENVIRONMENTAL
IMPACT STATEMENT

Suffolk Community College
20 East Main Street
Riverhead, New York
3:00 p.m.
December 8, 2014

S P E A K E R S:

BERNWARD J. HAY, PH.D, The LOUIS BERGER GROUP,
INC.

JEAN BROCHI, Project Manager, EPA, Region I

FRANK BOHLEN, UCONN

GRANT MCCARDELL, UCONN

A U D I E N C E S P E A K E R S:

ADRIENNE ESPOSITO, Citizens Campaign for the
Environment

MARGUERITE PURNELL, Fishers Island

BILL GASH, Connecticut Maritime Coalition

KEVIN MCALLISTER, Defend H2O

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2 DR. HAY: I think we are ready to
3 start. Welcome to this public meeting. Good
4 afternoon. Before we start, a couple of
5 housekeeping items. The sign is sheet outside.
6 I hope everyone has had a chance to sign in at
7 this point. The public rest rooms are on the
8 right side down the corridor, both ladies' room,
9 men's room. Also, please turn off your cell
10 phones or put them on vibrate.

11 My name is Bernward Hay. I am with
12 the Louis Berger Group. We are under contract
13 with the University of Connecticut, which is
14 under contract to the Connecticut Department of
15 Transportation. We have been assisting the
16 Connecticut Department of Transportation and the
17 EPA to prepare a Supplemental Environmental
18 Impact Statement for the potential designation of
19 one or more dredge material disposal sites in
20 open waters. The EPA is the federal lead agency
21 for this project. In addition to this public
22 meeting, there will be another one tomorrow,
23 which will be held in New London, Connecticut.

24 Today's meeting is designed to
25 present findings of the physical oceanography

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2 study that was conducted as part of the
3 Environmental Impact Statement. This meeting
4 will be informational, and there will be a
5 presentation. Therefore, there is no comment
6 period, but we do have time for questions and
7 comments at the end of the presentation as well.

8 Ms. Jean Brochi is the project
9 manager of the Ocean and Coastal Protection Unit
10 of the EPA. She will open the meeting, and will
11 give you a project update. Then this will be
12 followed the physical oceanography presentation
13 by Frank Bohlen and Grant McCardell from the
14 University of Connecticut Marine Science
15 Department. Again then we will have some time
16 for questions and for comments.

17 The meeting is recorded by a
18 stenographer, and also on audio devices, and the
19 transcript will be available. After the meeting
20 at some point, it will be made available to the
21 public on their web site, at the EPA's web site.
22 With this, Ms. Brochi will open the meeting.

23 MS. BROCHI: The other speakers
24 probably won't need a microphone, but I do. Even
25 with the microphone, if you can't hear me, please

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just raise your hand or ask me to repeat something.

Anyway, thank you all for coming out this afternoon on this wonderful winter day. If you haven't been to a meeting before, this is an EPA meeting, and it is a combined EPA Region I and Region II. We have several EPA representatives here. I am Jeanie Brochi, as Bernward said. Mel Cote, my manager is here. Doug Pabst and Pat Pechko from Region II, and Alicia Grimaldi, who you met when you first signed in, is also from our office in Region I.

This is for a Supplemental Environmental Impact Statement for Eastern Long Island Sound. The last set of public meetings that we had in this facility, actually, was in June, June 25th and 26th. Again, the primary focus of this meeting is for the physio study, and Frank Bohlen will start that off.

Again, under the Marine Protection and Research Sanctuaries Act and the Clean Water Act, EPA and the Corp of Engineers share responsibility for dredge material management. Several Corp of Engineers personnel are here

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2 today. Under Section One of Two of the Marine
3 Protection and Sanctuaries Act, EPA has the
4 authority to designate disposal sites for dredged
5 material.

6 The Long Island Sound Dredge
7 Materials Disposal Site designation was
8 officially, the final designation was in July of
9 2005, and that was for the western and central
10 disposal sites. The Corp has the authority to
11 select sites on a temporary basis. So Cornfield
12 Shoals and New London disposal sites, which are
13 at the eastern part of the Sound, were selected
14 by the Corp of Engineers, and expire in 2016.

15 Here are the disposal sites. You
16 can see the Western, Central and this meeting is
17 focusing on the Eastern sites. Again, our role
18 is to designate disposal sites. In doing so, we
19 develop a site management and monitoring plan.
20 EPA also has a shared role in reviewing dredging
21 permits, but an applicant would apply to the Corp
22 of Engineers for a federal permit.

23 We are initially reviewing the
24 Environmental Impact Statement looking at site
25 screening, and there were site screening criteria

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both general and specific in the Marine Protection and Sanctuaries Act, which we followed. I didn't go into detail here, but I do have the presentation that went into detail from June.

Initially, we had the 11 sites in Eastern Long Island Sound. Now we are focusing on six sites, which include Cornfield, New London, Niantic, Orient Point, Clinton and Six Mile Reef. The physical oceanography study that you are going to listen to the result of and the analyses today initiated, the study initiated with some additional buoy locations, and the green shows the buoy locations, the labels show the historic sites, and the labels that are not in yellow show the dredge material disposal sites.

This process kicked off with a Notice of Intent in October of 2012. We have had several corroborating agency and public meetings, as I mentioned. One of the last public meetings, Sarah Anker's office recommended that EPA and the Corp start educational webinars to talk about dredging, the process of dredging and some dredge

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material equipment. We held one webinar so far, and it was done April 3rd, and it was well attended. So we want to thank any representatives, if you are here. Thank you. Thank her for us, because that was very well attended.

If you didn't sign in, please do so. But if you did, and you want to comment after this meeting, or you have questions, feel free to send it to the ELIS at EPA.gov E-mail system. If you are not on our verification system about upcoming meetings, please feel free to sign up for that. We also have the minutes from the meetings, and we will have all the documents posted on our EPA Region I web site. The address is listed up there.

The next step in this process is the further evaluate the site, draft rule making, and a draft a supplemental Environmental Impact Statement by spring 2015. We will hold additional public meetings at that time, and those will be official comment periods on the draft, and the draft rule making.

Assuming that the SEIS recommends

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2 designation on one or more sites, then we will
3 move forward with the final SEIS and rule making.
4 That would be no later than December 2016.

5 With that, I am going to introduce
6 Frank for the physo discussion.

7 DR. BOHLEN: Good afternoon. Can
8 you hear me? If you can't, speak up. I am Frank
9 Bohlen. I am a physical oceanographer at the
10 University of Connecticut Department of Marine
11 Sciences. I have been working on sediment and
12 sediment transport for 45 years. A fair amount
13 of that work has been done around dredge material
14 disposal sites, dredging and dredge material
15 disposal sites.

16 We have seen the evolution of
17 information over the past 45 years, and there has
18 been, believe it or not, a substantial evolution.
19 I want to emphasize that we are going to be
20 talking about the physical oceanography, physical
21 oceanography of Long Island, as in physics. Not
22 the biological, not the chemical, neochemical nor
23 the political. Physical oceanography.

24 We are going to be talking about
25 the physical oceanography in the Zone of Siting

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2 Feasibility. We will try to define that. By the
3 way, if at any time you don't understand the
4 language, don't be afraid to speak up, because we
5 often tend to speak our own language. It is
6 taken for granted that everybody knows where
7 Staten Island is, sort of thing. Then you come
8 out after the talk, and you find out that nobody
9 knows where Staten Island is. Holy Christmas.
10 So that doesn't work. Don't be afraid to ask the
11 question if you don't understand the language.

12 Physical oceanography in the Zone
13 of Siting Feasibility. Why? Because one of the
14 first questions that is often asked is, is the
15 stuff going to stay put, and under what
16 circumstances might it not stay put, and if it
17 doesn't stay put, where is it going to go. So it
18 makes sense to begin with the physics. Besides
19 the fact that it is the queen of the sciences, so
20 the remaining sciences are only the handmaidens
21 of the queen.

22 We are going to speak about the
23 model that is being developed and being used.
24 Why four? We can't measure all we need to know
25 at every point through the Zone of Siting

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2 Feasibility. We can measure characteristics at a
3 number of discreet points, hopefully selected
4 discrete points, and then use that to build a
5 model that will allow us to really assess on a
6 much finer spatial scale than we could ever hope
7 to do by measuring.

8 A model is important today in
9 practically everything we do. We wake up in the
10 morning and we look at the weather forecast, it's
11 a model. We are going to be using a model, a
12 development model. Then we are going to evaluate
13 the model. How good are the simulations
14 presented by the model. It will give you some
15 indication of what the results indicate, and
16 provide you with a summary.

17 The science that explains the
18 patterns of ocean circulation and the
19 distribution of property such as temperature and
20 salinity. That is where we all started. Nansen,
21 Fridtjof Nansen back in 1900 where physical
22 oceanography really started, the Norwegian
23 school. Somebody tried to figure out it what it
24 means in terms of circulation, what all that
25 means in terms of herring. But we go beyond that

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2 right now, and we look at currents, circulation
3 of the water, waves, and the affects of those
4 flows on the movement of sediments.

5 Of particular importance within
6 this study, because you are asking me where the
7 stuff is going to go is why this stuff going to
8 go. It is going to go because you are exerting a
9 certain force on it. We measure that force in
10 terms of force per unit area, which we call
11 stress. We are all stressed at some point. This
12 is stress. Again, capisce? Go back to our
13 friend Sister Sarsaparilla in the fifth grade or
14 so, and she was telling you about forces, or flow
15 going over a surface. A change in velocity as
16 you are bringing a flow to a certain -- because
17 you are beginning to reserve force in that
18 circuit and you drag it along, and you may
19 disaggregate it, and you may break it down. So
20 you are going to hear a lot about boundary shear
21 stress, because the boundary is where we are
22 working, and the shear stress is the force that
23 may affect, take a form and move it over a
24 boundary.

25 This is a little primer I studied

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2 in the past that really doesn't work, but it is
3 one you will see in all the texts. So it is up
4 there for you to take a look at. It really was
5 designed for the next set of terms you are going
6 to hear a lot, using noncohesive sediments. The
7 general class of noncohesive sediment which I
8 believe we are all familiar with is beach sand,
9 discrete, granular material, with very little
10 binding beyond gravity. I will take questions on
11 it later.

12 The materials that we deal with are
13 for the most part cohesive. They may be fairly
14 coarse grained, and you can get sand, but they
15 are stuck together by other stuff than simply
16 gravity. It may be the technical term snot as
17 the interface, a mucilaginous matrix associated
18 with biological activities along the boundary.
19 You can actually stick sand together and cause it
20 to be cohesive. But more typically what we are
21 looking at is finer grain materials than sand.
22 We get down well below the millimeters. We get
23 down to the microns. 63 micron break over
24 between silt and sand. Then you get down to
25 about 4 microns or so and you get into the clays.

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2 When you get down to the really fine grains, you
3 not only have the possibility of having a
4 mucilaginous matrix, but you also have
5 electrochemical binding, differences in charge of
6 the particles. Those little magnets, they stick
7 together.

8 When you get down to that scale,
9 and an awful lot of the material we are dredging
10 tends to be fine grain silts and clays that are
11 very cohesive, what you are looking at, in
12 distinction from this picture that you have up
13 here, where it is showing off an individual grain
14 sitting up on top here, as you would with sand,
15 really what you have is a matrix. It is all sort
16 of glued together, and the stress tends to break
17 down the bulk. It doesn't go off grain by grain.
18 It tends to sit there until it was breaks down in
19 bulk failure.

20 Another thing to consider when you
21 are taking a look at the boundary is the effect
22 of the boundary on the velocity field above the
23 boundary, language. The boundary affects the
24 velocity field, the flow right over that
25 boundary. You can believe there is something up

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2 here. As we get closer down to the boundary, we
3 get closer to more and more friction, the flow is
4 going to slow down. That gradient in velocity as
5 we get down closer to the boundary is the stress
6 we are talking about. There are a variety of
7 factors that are affecting it. That is all they
8 are trying to show you here, and you have got a
9 rather complex velocity field. That is the
10 vertical. Here is the velocity coming down to
11 the boundary. You see it over here, the velocity
12 coming down to the boundary is rather complex
13 because of some effects of the boundary on the
14 flow. Another whole class to deal with that.

15 We sometimes have panels, and this
16 is the famous Shields diagram showing something
17 about particle characteristics against critical
18 erosion velocity. The only thing you can take
19 from this is there is a significant difference
20 between the gluey, sticky cohesive stuff and the
21 more granular noncohesive stuff. That is really
22 all you need to get off this. We will see more
23 of it as we go along.

24 A table summarizing some results,
25 laboratory and field, shows you that as you go

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2 from course sands up through progressively finer
3 materials, getting more and more cohesive, you
4 have got a significant change in critical shear
5 stress studies. We are looking out here at the
6 stress, at the initiation, it is called the
7 initiation of motion, first motion. We are
8 getting into this in terms of Pascals. You are
9 familiar with pounds per square inch, probably.
10 You may have heard of millibars. That is
11 pressure. We usually hear pounds per square inch
12 in terms of atmospheric pressure. That tends to
13 be a vertical pressure.

14 This is the same sort of thing,
15 except it is horizontal. Pounds per square inch,
16 force per unit area. We can put it out in a
17 variety of units, but one of the most common
18 units is Pascals. You can Google it up and see
19 what it means. If you care for Dynes per square
20 centimeter, you will find it at the back, and you
21 can convert that to pounds per square inch.

22 But the game today, we are going to
23 be playing mainly with Pascal, and the thing I
24 want to call your attention to for part of the
25 discussion at least later, is an interesting

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2 variation in this critical shear stress, Tau C,
3 from point 4A up to a very high value, 18. This
4 guy is circled out at about three quarters of a
5 Pascal for something like fine sand. As you get
6 finer and finer material, more and more cohesive,
7 the critical stress goes up.

8 That is sort of counterintuitive.

9 You believe in a kitchen if I have a pile of sand
10 sitting on a counter and I blew on it, not much
11 might move. But if I had a pile of flour sitting
12 on the counter and I blew on it, a fair amount
13 might move.

14 So she says why is it that the
15 coarse grain stuff actually takes less force than
16 the fine grain stuff. The answer is cohesion, it
17 is stuck together. If you dammed up that flour,
18 and if you have played with flour, you know you
19 have got to sometimes scrub your hands pretty
20 good to get rid of it, you will find that it is
21 more difficult to move. So that is a bit
22 counterintuitive, but it is also one of the
23 reasons why you see so much dredged material
24 sticking around.

25 MR. GASH: Are you taking

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2 questions now, or do you want us to wait?

3 DR. BOHLEN: Questions later. If
4 there is something not clear up here, please. We
5 have a critical value here, something like three
6 quarters of a Pascal and it goes up. So there
7 are some interesting responses that you can play
8 with.

9 The objective of the physical
10 oceanography study. The first thing is the Zone
11 of Siting Feasibility, understand, is this blue
12 guy right here.

13 It sort of goes from Gilford over
14 to Medico, right out here. You have got long
15 standing shoal and a fair piece of the Eastern
16 Sound sitting in here. Montauk to Block, Block
17 to Port Judith is the Zone of Siting Feasibility,
18 ZSF, for this study.

19 The Environmental Impact Statement
20 is going to be going around. This side is hard
21 to read on either side. It shows you a number of
22 the dredged material disposal areas. A couple of
23 the active ones, the Cornfield and New London.
24 You have got here a number of the historic ones.
25 There are about six historic ones sitting in

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2 there, and there are about four new ones in
3 there. You can see that down in the panel on the
4 side here.

5 The purpose, stress. Describe the
6 distribution of maximum bottom stress in
7 magnitude as reflected in the zone. Characterize
8 the circulation. Mind you, boundary shear stress
9 is what gets this stuff moving. Then the
10 circulation over the vertical is what transports
11 it away from the initial point of introduction.
12 Also recognizing that some amount of material is
13 going to be interred in the water column when you
14 dispose of the material. There will be a bit of
15 a cloud. You care about the vertical circulation
16 as well as the boundary shear stress. Acquire
17 physical oceanography data sufficient to
18 calibrate, verify the model. Clear, more or
19 less?

20 Everybody knows where you are,
21 right? Staten Island. You probably have some
22 sense of the circulation in the Long Island
23 Sound, right? If I tell you that it is tidally
24 dominated, that is probably not too much of a
25 surprise, I would hope. This is a set of

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1 stations that was occupied over the course of the
2 Long Island Sound study. It started about 1988
3 and ran intensively in the early 1990s, and it
4 has been going on. A fair number of stations are
5 still monitored by DEP, and to some extent, DEC.
6 The only one I want to call your attention to is
7 this guy up here, which you can't read, and in
8 fact, I couldn't read. I put a magnifying glass
9 on it to determine that is M3 at the race, East
10 River to the race.
11

12 You recognize that one of the
13 factors affecting circulation in the Sound is
14 fresh water inflows, that there is a regular
15 seasonality to your fresh water inflows. This
16 comes from the Connecticut River, which
17 represents something in excess of 70 to 80
18 percent of the fresh water inflow to the Sound.
19 So you get a feeling for the seasonality, peak in
20 May, typically, snow melt up north. That is the
21 assumption that there is a snow melt, but that is
22 fairly typical, and a lull in the mid summer.

23 You see that I have got a tidal
24 influence, and I can believe that we can make
25 this a twice a month variation, and I have got a

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2 river influence, and it may displace some
3 seasonal variations. We have got some temporal
4 variations in the circulation of the Sound. They
5 show up in water temperature. This is a set of
6 slides that shows you the April, August and
7 December temperature profiles. At the end, here
8 is the East River below us, Throgs Neck over
9 here. You get an idea that there is a deep
10 seasonality in the temperature profile.

11 Again, it is all pretty much common
12 sense. You have got to believe there may be a
13 little bit of a time lag, but this afternoon, we
14 are cooling down the water in the Sound. If you
15 wait a while, it is going to get pretty cool out
16 there. Then you are going to warm up Riverhead
17 pretty quick. Coming through Long Island
18 summers, you are going to warm quite so fast.
19 You are going to get a big reservoir of heat
20 sitting out there, or cold, the absence of heat.

21 Temperature, salinity, that change
22 of fresh water inflow is going to show up in the
23 salinity structures. Temperature, salinity
24 characteristics affect the density of the water
25 column. Just like the density of the air affects

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atmospheric circulation, the wind, the density of the water column will affect the circulation of the water column. Now we have tides and we have got this density field operating. This is just a picture of the tidal circulation from a model I found on the web. If you want to Google it up, you can take a look at this guy. A little hard to see, but what is important here is the spatial variations. Much lower velocities in the western sound versus the eastern sound. We have got a lot of velocity flow through the race. That is what you are seeing right up to here, and you can see fairly low velocities down here.

If I run through a tidal cycle, you can get an idea that it is coming and going. Move it back one, that is coming in. Still pretty strong flows in the eastern Sound in flood, and here is another flood, and here we go turning into the ebb. A little stronger on the ebb. Fair amount of spatial variation, fair amount of temporal, time, relatively short time scale, six to twelve hours, and then we drag that out to the monthly cycle.

Let's take a look at a little film.

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2 We will stop here for a second. This is not to
3 impress you with the graphics, but here is the
4 study area, right. If you look up on top, you
5 will see a date. This is surface salinity that
6 you are looking at.

7 MS. ESPOSITO: Is that this year,
8 October 22nd this year? I can't read it.

9 DR. BOHLEN: This is October 22,
10 2012, for a period, but the detail detail is not
11 as important as the nature of the enemy. You are
12 dealing with a system. That is what is going on.

13 MS. ESPOSITO: Frank, is that just
14 the surface?

15 DR. BOHLEN: That is the
16 surface, that is surface salinity. Of course you
17 can see the Connecticut River coming out here,
18 and the ebb and the flood sweeping it around.
19 You can see the variation from higher salinities
20 off shore to progressively lower salinities as we
21 come in. The technical salinity variation east
22 and west in the Long Island Sound is about four
23 parts per thousand. These guys are in units of
24 hundreds of percent, hundreds. We call it 35
25 parts per thousand. You might call that 3 and a

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2 half percent. Salinities are normally marked
3 out. On this guy here, you will see it goes 32,
4 31, 30, that is 3 percent salt. Oceanographers
5 always deal with 4 points within a 31.445.

6 That is the system we are dealing
7 with, sort of on average. If we keep running it
8 long enough, actually, and it would take half an
9 hour to tell you about how the system responded
10 to Sandy, because October 29th was Sandy. We
11 just walked by Sandy. Go back to the slide.

12 This just gives you an idea that
13 not only are we worrying about spatial variations
14 in temperature salinity, and some of the temporal
15 variations that go along with them, but we also
16 have to care about the waves. Surface waves have
17 a velocity associated with them that interacts
18 with the tidal and the density driven velocity
19 field. So we have to worry about that, and this
20 is just showing you two areas, one a little north
21 of Montauk here, and the other sitting over here
22 by Orient Point, and some of the wave
23 characteristics as we wander down here. That is
24 all you are looking at here. The significance of
25 the blue and the red in this, we are not talking

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2 about that right now. That is actually a model
3 run to compare, observed to a model. But what
4 you are getting out of this is that there are
5 some significant spatial variability in wave
6 heights, as you start marching into the Sound.
7 Again, not terribly surprising because of the
8 sheltering and because of the shallows.

9 What is the distribution and
10 spatial variations in the bottom stress, what are
11 the regions in which the maximum stress are the
12 smallest, and where, if the stuff does get
13 stirred up, does it go. Sort of pretty
14 fundamental questions. The model, Grant
15 McCardell.

16 DR. MCCARDELL: Hello, everybody.
17 I am Grant McCardell, also from the University of
18 Connecticut. I am going to be talking some about
19 the model we have developed to look at
20 distribution of the stresses.

21 You saw an example of the model
22 output just a few moments ago with that movie of
23 the surface salinity. The reason we run models,
24 as Dr. Bohlen stated, is because we are unable to
25 go out there and make measurements over every

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2 single space at every single time. So we make
3 some measurements at certain times, at certain
4 locations, and we use those to be able to what we
5 call tune a model. We then have to hope that the
6 model is replicating reality, at least to a
7 certain extent, in order to use the model to make
8 predictions about what might or might not be the
9 current during more extreme events, and in other
10 locations. That is where we have areas.

11 The model that we are using is
12 nested within a bigger model. It is nested
13 within a model of the northeast coast and the
14 northwest Atlantic. It is forced by tides, it is
15 forced by observer floats, so we go and we get
16 historic data, or get the model run from USGS
17 stations.

18 It is forced by climatology, and by
19 climatology here, what I am referring to is what
20 are the average conditions at a given space and
21 date. So the climatology for Riverhead, New York
22 for today's date might be that the average
23 temperature is 35 degrees, and that is what we
24 were using. So that is what we mean by
25 climatology terms.

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2 We also use climatology for the
3 initial conditions. When you run a model, you
4 have got to start somewhere, when we run this
5 model long enough before the study period that is
6 we are using the conditions for that actual
7 period.

8 What is a model? The model that we
9 call a primitive equation model, by primitive
10 equation, we mean that it is based on first
11 principles, it is based on Newton's laws that
12 were developed in the 17th Century by Sir Isaac
13 Newton. Those laws were further expanded to
14 fluid dynamics in the 19th Century. It is a set
15 of equations called the Navier-Stokes equations.
16 Those are very well thought to represent fluid
17 flow. They even model turbulence and all sorts
18 of things. They are very rich sets of equations.

19 There are a rich set of equations
20 that lend themselves to computer models. They
21 did not lend themselves very well to analytic
22 solutions in the 19th Century, but they have
23 blended themselves very well to be able to use
24 high speed numerical computers to represent these
25 equations, and then simulate the motion of

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fluids. The same sets of equations are used in ocean models. They are also used in atmospheric models. So when you looked at the weather forecast this morning, it is because someone had brought a primitive equation model on the current conditions from yesterday, and extended that to be able to tell you what tomorrow is likely to be like.

In the model, the bottom stress magnitude which is what we are interested in here for the purposes of this study is computed according to the formula that you see down here. It is $\tau = \rho \cdot C_D \cdot U^2$. ρ is the water density. Find C_D . C_D is just a constant. We normally take it to be point zero zero two five. It varies somewhat, but spatially, different studies vary. Then that is times the square of the water velocity. So in other words, if I double the water velocity, I increase the stress four fold. This also makes bottom friction non linear, which means that these models behave in a non linear fashion, which means that the models really are a pretty complex source of behavior.

Here is what our grid looks like to

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the bottom of your right. Again, this is nested within a bigger model that covers the rest of the shelf out here and then up to the northwest Atlantic, and this is our model. It contains about 30,000 triangular elements, each one of which contains 15 depth elements. So we have got a total of about 500,000 volume elements running this model.

In red right there, what I am showing is the area of our study. So red is the area of the study, and here it is to that red area. You can see that this model is made of discrete triangular mesh. It is important to realize that the resolution of this mesh is also the resolution of the output of this model. It is certainly much better than any survey we could ever do. We could not take a ship and survey every single one of those little triangles, nor could we go put buoys in every single one of those little triangles. But it is nevertheless of limited resolution. If we want even higher resolution than that because you want to know what is happening at Point Judith right at the pier, we can nest even finer triangles within

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2 this mesh. But it is impractical to use finer
3 scale triangles over this domain, and we need to
4 get the flow right over this domain to able to
5 get the flows right at a finer scale.

6 So the current resolution is about
7 1 to 500 meters, which is about a quarter of a
8 mile, which is a fine enough resolution to
9 distinguish between potential dredge sites, but
10 it is not a fine enough scale to talk about
11 moving the boundary 100 feet east or west.

12 We wonder how does the model work.
13 We have calibrated it. We have calibrated it
14 using sea level heights, and we use sea level
15 heights throughout Long Island Sound and New York
16 Harbor. We also calibrated it using records of
17 temperatures that we have, records of salinity
18 that we have. As far as how well the models
19 read, it really does quite well. I would call it
20 state of the art in terms of oceanography
21 readings. We have got Skills of 90 percent or
22 better for sea level height, water currents,
23 temperature and salinity.

24 With that, we are going to talk
25 more now about evaluating a model compared to

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2 stress. Dr. Bohlen is going to talk more about
3 that.

4 DR. BOHLEN: So you are a skeptic
5 about this model stuff. We all are. We live
6 with skepticism. A little bit of cynicism but a
7 lot of skepticism. So we are going to go back
8 out and we are going to measure at a discrete
9 number of points. Deploy instruments, and the
10 instruments are mounted on bottom frames. You
11 will see them in a minute. We did talk about
12 buoys, the buoy floats. There may be a little
13 lobster pot to help us sort of find it, but the
14 measurements that we are taking are bottom
15 mounted arrays.

16 Here they are. Seven bottom
17 mounted tripods, three two-month observation
18 Campaigns to try to get a feeling for some of
19 this time variation that we are seeing earlier.
20 We know that we are never quite where we want to
21 be. It used to get to be a curse if they see us
22 walking down the dock and know there is a storm
23 coming.

24 You would like to have it out there
25 for a fair range of conditions, and you can

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2 believe that the conditions in the summer are
3 somewhat different than the conditions in the
4 winter, or the conditions during the seasonal
5 transition, spring and fall seasonal transition
6 are going to be different than the winter.

7 So we tried to pick three periods
8 where a variety of conditions are going to be
9 seen time wise. Then we are going to try site
10 these seven stations that you see here in red,
11 you can see they are in red, at a number of
12 locations where we might expect to see
13 differences in bottom shear stress. So we get a
14 range of conditions, gather up that data and come
15 back and use them to verify, evaluate the
16 accuracy of the model. Clear?

17 Here are the periods. Our spring
18 period is March through May. About each one of
19 these is on the order of 60 days, you see
20 everything. The spring period you saw on that
21 river discharge chart is a time when you expect
22 to see elevated river discharge, and it might be
23 windy as well. For those of us that live on the
24 water, the spring can be pretty windy around
25 here. Then the summer, lower river flow, and

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again for those guys that are sailors, you know when it gets nice and warm, the wind dies. Generally lower energy. Come winter, lower river flow, but with high wind. So three Campaigns. You will see this Campaign number one, two and three.

Here are the frames. Pretty standard stuff today, with the exception of there is a little guy that sits down here that says Nortek, which is the manufacturer of acoustic doppler current profiler, ADCP. That is what you are going to hear a lot about in this study, but more and more, you are going to hear about it when people talk about measuring currents. We don't put a single current meter out any more. We actually have a single current meter at the bottom that allows us to take measurements of the whole of the vertical, or at the surface and take measurements over the whole of the vertical. Very, very useful tool.

This Nortek I said was a little bit revolutionary in the game. It is what they call a pulse coherent acoustic doppler current profile, meaning that you can make very small

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1
2 measurements. The RDI that sits up on top of the
3 ADCP, that is the upper looking guy, that is
4 measuring about once every meter over the
5 vertical. The Nortek measuring centimeters over
6 the bottom three quarters of a meter. So really
7 fine slicing down to the boundary, which is what
8 we care about. Remember? We really want to get
9 those measurements down to the bottom. Grant
10 showed you the equation, the square of the
11 velocities, the east west velocity and the north
12 south velocity. We are really able to measure
13 those accurately right down to the bone, and we
14 can with the Nortek. This thing also has a
15 temperature salinity sensor sitting over here,
16 and a couple of probes along here, and another
17 one here that says OBS, Optical Back Scatter, so
18 we can measure the concentration of stuff in the
19 water column.

20 This will sample, burst sample
21 maybe four times an hour a whole array for a
22 couple of thousand samples. So you can get a lot
23 of data on the structure of the flow both over
24 the vertical, we are looking for far field
25 affects over the vertical, and in terms of

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1
2 resuspension, the boundary shear stress at these
3 points. They are discrete points, and that is
4 what you are measuring; water column currents and
5 waves, currents near the sea floor, stress,
6 suspended sediment concentration and temperature
7 and salinity. That frame stands about 6 feet
8 high or so, and about 8, 10 feet triangular.

9 When we were out there working on
10 the frames, changing batteries and so forth, we
11 had to get out there, so you run a ship out from
12 Avery Point to the stations. Along the way, you
13 take temperature and salinity measurements at a
14 number of points. This is a conductivity
15 temperature depth profiler, profiling
16 conductivity temperature depth, CTD, along with a
17 series of bottles in here. So as you are
18 lowering it down, you can take discrete water
19 samples over the river, and bring those samples
20 back. That allows you to calibrate your
21 instruments. The OBS is an optical sensor
22 looking at what is in suspension. How do you
23 know that it really is telling you the truth?
24 You draw some water samples, filter them down,
25 compare them with the OBS. That is the water

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1 samples. You get your temperature and salinity
2 from that. Sediment samples, for each station
3 that we are doing the BP task, we will get a
4 sediment graph. We will get an idea of the
5 distribution of the sediment in the study area as
6 well.
7

8 This is just showing you some of
9 the track. It doesn't really mean very much
10 because yesterday, the track didn't look like
11 that, and tomorrow, it probably won't look like
12 that again. You get from station to station,
13 depending on how the weather goes.

14 The data recovery. That is an
15 interesting slide. The data recovery is pretty
16 good. You have three Campaigns, one, two, three
17 in each of these boxes. The first guy shows you
18 temperature salinity, and it shows you pretty
19 much blue, which says full or near full data,
20 greater than 50 percent. You have got a lot of
21 temperature salinity there. You go out here and
22 you say currents and suspended sediments near the
23 sea floor. That is that Nortek ADCP. The most
24 coherent guy is looking at the bottom 75
25 centimeters or so. You see the blues are in the

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2 middle guy, lighter blue here and yellow.

3 The first time we put this guy out,
4 the manufacturer had claimed the certain life of
5 the batteries. So we figured we would go out
6 once at the beginning and once at the end of the
7 deployment period, charge up the batteries. We
8 went out there after about a week or two to check
9 things out, and the batteries were bad. So that
10 is why the Campaign One data recovery rate is
11 somewhat lower than it was in the other Campaign.

12 Same thing goes for the two zeroes
13 down here for ADCP's. This is now just telling
14 you the problems of doing this kind of
15 measurement. These two instruments were sent
16 back to the manufacturer for refurbishment, and
17 sent back all refurbished, ready to go with the
18 wrong firmware. You put it in the field, and you
19 get no data, that sort of thing. But overall
20 when you are taking a look through this, you say
21 the data recovery rates are well in excess of 50
22 percent, and probably bordering on 80 percent for
23 a lot of the sensors.

24 DR. MCCARDELL: We did not expect
25 to have that percent. 50 percent was what was

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1 anticipated.

2
3 DR. BOHLEN: A few years ago, if
4 you got 10 or 20 percent, you would really be
5 feeling good. Just some examples of the
6 observations. This is mean flow, an average,
7 near the bottom. This is the RDI, the ADCP that
8 is looking up. You are 3 meters off the sea
9 floor here, and this is the long term drift.
10 This is not an instantaneous measurement, it is
11 an average over many tidal cycles.

12 You can see it here, if you look
13 carefully at these, you will see they are three
14 different colors in every one of these. You can
15 see in general, the mere bottom flow will
16 generally drift into the Sound. It is a
17 characteristic estuarine flow.

18 You have the higher density,
19 saltier water at the bottom, and it tends to
20 migrate into the estuary, as opposed to the
21 characteristic fresher, lighter surface waters
22 that tend to migrate out. The waters of Long
23 Island Sound are not getting fresher and fresher
24 as the Connecticut River water comes in, so where
25 is it going? Out. You have got a characteristic

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2 in at the bottom under the surface, and that is
3 what you are looking at here.

4 This is now at the premier level,
5 and we are going to come all the way up for you.
6 It is just that they picked 3 meters here. This
7 is the Nortek now, about a half a meter from the
8 sea floor. It is the same sort of thing. You
9 get an idea of the magnitude. The magnitude is
10 shown in here on the order of 10 centimeters a
11 second once again. Capisce? 10 centimeters a
12 second? Are you comfortable with 10 centimeters
13 a second? You don't have to lie to me.

14 A nautical mile per hour, one knot,
15 nautical mile per hour, 50 centimeters a second.
16 Does that give you a feeling for what 10 is?
17 Better? That is a mile per hour, sort of like in
18 a car, a little bit more, 6,080 feet, instead of
19 5,000 and some. So just to give you an idea, 10
20 centimeters a second as the average drift, pretty
21 slow. 3 centimeters a second is a foot per
22 second. So that is the drift, that is the
23 average drift. You stir this stuff up and it is
24 going to go back and forth, back and forth, back
25 and forth, and it is going to keep marching out

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2 at the surface. At the bottom, back and forth,
3 back and forth, back and forth, marching in. On
4 average, about 10 centimeters a second, the
5 average flow rate. Clear?

6 This is just showing a little bit
7 about the tidal amplitudes in that these are
8 tidal ellipses for each of the Campaigns. Again,
9 what you are seeing roughly, this is now over the
10 vertical. The M2 is the principal lunar
11 component of the tide. You will see that
12 generally things are acting along the axis of the
13 of the system, which is about what you would
14 expect. You can get some idea of the magnitude
15 on this whole thing. This is a graphic. That is
16 about a half a meter per second over here. So
17 you get an idea that you have on the order of a
18 knot or so max flows down in here. As you get
19 down further out in here, the velocities go down,
20 which is what you are seeing ad nauseam. You saw
21 it in the first model, you saw it in the trip
22 model.

23 With the wave statistics, one of
24 the things we are looking at here is the extent
25 to which the waves are influencing bottom shear

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1 stress. One of the questions is always sensitive
2 to areas that are going to be influenced by the
3 waves. To make a long story short here, what
4 these data are showing, there is a difference.
5 In our bottom stress profiles in here, we are
6 looking at time against the magnitude of the
7 bottom stress. You will see this is the spring
8 neap monthly cycle, the stress as you are looking
9 at moving up here. Up here is time, and this is
10 wave amplitude and varying over the period. What
11 you would like to see, if there was a neat
12 correlation between the two, is the influence of
13 the wave on the bottom stress.
14

15 To make a long story short here,
16 probably not surprisingly, there isn't much of a
17 correlation, because the stations are, for the
18 most part, outside of "the wave base," the area
19 that you expect to be influenced by waves. Which
20 makes sense because you want to set a site for
21 disposable materials that is probably, for most
22 of the sites, tends to have as few influences to
23 move this stuff around as possible.

24 The guy on the bottom is showing
25 you a relationship between velocity and the

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2 distance over the vertical, and it is just
3 showing you there is a difference at the two
4 sites as we are coming in here, at the two times
5 as you are coming in here. This is another site
6 looking at the same thing, and probably the same
7 answer.

8 One of the things I didn't point
9 out, and you may have missed on the very first
10 slide that had the zone of citing feasibility, is
11 around the margin of it was a gray border. That
12 has been defined by the Army Corp and EPA as the
13 area where you are too close to shore, and you
14 may be more likely subject to wave influence. So
15 that is looking pretty good so far from these
16 data.

17 DR. MCCARDELL: Because it is
18 shallower.

19 DR. BOHLEN: Because it is
20 shallower. I thought that went without saying,
21 right. Closer to shore is shallower.

22 MS. PURNELL: Is that set at 14
23 feet? Is the boundary set at 14 feet?

24 DR. BOHLEN: I don't know.

25 DR. HAY: 18 meters.

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2 DR. BOHLEN: 17, 18 meters.

3 MS. PURNELL: Thank you.

4 DR. BOHLEN: We can argue about
5 the 17 or 18, but it is not going to affect it.
6 This gets a little esoteric for you. This is the
7 plot that Grant, when he was talking about the
8 model formulation, he said he was going to be
9 using a formula that had a drag coefficient in
10 it, and he mentioned just sort of off hand, our
11 drag coefficient, $C_{sub\ d}$, is generally on the
12 order of 0025. This was a plot to check out
13 whether that made any sense or not. What we are
14 taking a look at here is a log plot sitting along
15 here. There is a log law down in here, and there
16 is a bulk formula on here. If everything on the
17 vertical bulk formula, on the horizontal log law,
18 if everything was fine, it would be laying along
19 a single line, a log law.

20 It looks pretty good on this,
21 laying along a single line until you get up in
22 the vicinity of about a Pascal. When you get up
23 to a Pascal or so, that begins to break down a
24 little bit. This is where the complications come
25 in. Why four? Because all sorts of things at

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1
2 this point start influencing the characteristic
3 of the near bottom velocity field, the velocity
4 over the vertical, the boundary layer when you
5 get down to there. When you begin to stir up
6 sediment into the water column, you begin to
7 change the relationships that govern the
8 distribution of the velocity over the vertical,
9 the friction characteristics of the flow change.
10 You can also change the pressure distributions at
11 the bottom as they affect the flow field.

12 That is being verified here really
13 as you see, you get up here pretty well, and you
14 begin to break off somewhere around, if you can
15 see it, right around here. Then you get off and
16 say how many things are going on. But the long
17 and short of this one is that the measurements
18 using the log law support the use of the bulk
19 formula with a drag coefficient of about 0025, up
20 to at least one Pascal.

21 I thought this was hard to see, and
22 it may be that I am getting color blind as my age
23 passes, but one of the things this is showing you
24 is that model simulations reproduce tidal and the
25 spring neap variations on the observed stress.

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2 You have got a neap, spring neap variation. Do
3 you understand spring neap? Is that all right?

4 The monthly variations, twice
5 monthly variations. We are near full moon tide
6 right now. You drive down 25 this morning, this
7 afternoon, and high water is pretty near the
8 road. That is not counting what is going to
9 happen when it is going to blow for the next day
10 and a half. We get off the full moon, and the
11 tidal experience is somewhat reduced. We get
12 back on the new moon, and it is increased. That
13 is the spring neap cycle. That spring has got
14 nothing to do with May June either.

15 What you are seeing here is a
16 variation over the course of about 14 days or so
17 of a spring neap cycle. You can see, if you can
18 see it, if the blues and the purples weren't so
19 close together, that the model is doing an
20 excellent job of reproducing the stress that is
21 measured from the array.

22 DR. MCCARDELL: The model is in
23 red, and the data is in blue.

24 DR. BOHLEN: You can see it down
25 at the end in the blue. That is why they dove

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2 off the end down in here. There is no data out
3 there. So we got a pretty good feeling for that.

4 Here, we are looking at a
5 comparison between the measured and observed
6 again. This is now the model, modeled and
7 observed or modeled and measured. This is the
8 model and this is the observed, and you can see
9 if there was a perfect fit, a one to one fit,
10 everything would be laying on this line right
11 here. So it is just a slight variation for the
12 means, these are the mean velocities now. Then
13 for the max in here, it is a little coarser. The
14 R squared is about point 7 in here. It is
15 something over point 9 in the case of the means.
16 But in the world of modeling versus measuring,
17 those correlations are excellent. That is a high
18 correlation. You are very happy with how well
19 your model can do for you when you are talking
20 about those kinds of values.

21 MS. PURNELL: Again, that data and
22 the prior slide's data, that averages over all
23 seven of those arrays? Is that how you came to
24 that?

25 DR. BOHLEN: I had forgotten what

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2 I had on this one. Yes, it is.

3 DR. MCCARDELL: Yes, it covers
4 the stress during the entire Campaign.

5 DR. BOHLEN: For all seven arrays.

6 DR. MCCARDELL: The maximum amount
7 of stress during the entire Campaign.

8 DR. BOHLEN: Right. One of them,
9 I had just one Campaign. Here is the analysis.
10 Find the maximum bottom stress magnitude at each
11 point in the Zone of Siting Feasibility in the
12 three Campaigns, compare the values at sites
13 identified in the screening process. That is the
14 sites for potential disposal areas. Simulate the
15 period and the characteristics that you might
16 expect during a storm, and Sandy came to mind.

17 Here is the Bathymetry, water
18 depths through the study area, and these are the
19 stations, DOTs, groups, and the sites. You get
20 an idea of what the water depths looked like
21 through the system. Are you comfortable with
22 that? Pretty deep into the vicinity of the
23 arrays. Montauk through the square deep, shallow
24 is here. Is that okay?

25 Stress values. Here are your

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stresses in Pascals. Reds are three, and that number that we were playing with in that panel before, point 75 or so, is somewhere down in the blues, down in here. So if we say that a fair amount of the area in the Zone of Siting Feasibility has got fairly high stress, that is what that guy is saying.

The one thing that is interesting is that the spatial differences, if we run this now for each of the Campaigns, and we can go beyond the Campaigns now that we have a model, we can run it every month if we care to, you are going to find that the spatial differences are much larger than the seasonal variations.

Which sort of makes sense because you figure that wind and wind waves are probably the primary factor affecting the turbulence over the vertical. We were seeing before that wind and wind waves have relatively little affect on bottom shear stress in the area that we are picking. You have got to get much closer to the beach to find that.

So to give you a sense of what the stresses look like, you are within a one and a

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half Pascals sort of range up in there. You get up into Fishers Island Sound or close to Fishers Island Sound, you are getting down to your point 7 or so. You get out into here, you get down around Montauk, you are up around 2 and behind Montauk.

Maximum bottom stress during storm conditions we observed through each of the Campaigns; one two and three. You can see this, we are allowed to go through this now and pick out different seasons, different locations.

Cornfield is fairly high. That starts dropping down. This is Eastern Long Island Sound break out here, Six Mile Reef, Clinton, Orient Point, New London.

Then we go Block Long Island Sound, outside of Eastern Long Island Sound, however you want to divide it. Fishers, this is the south side of Fishers near the deep hole for Fishers. Values similar to Clinton. You can sit and play with this. This is the kind of information that you will have to play with as you go through. That just summarizes some of the sites against that plot you had before.

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2 Sandy. This should come as no
3 surprise, the results from the Sandy analysis if
4 you lived here during Sandy. You had some winds.
5 This is now ledge, tip of Long Island Sound, west
6 of Long Island Sound and the Bronx. You have got
7 some winds that ledge, that might get up to 60
8 miles an hour. Is that a lot of wind? It is not
9 an afternoon sailing breeze, not around here, but
10 it is a fair amount of wind. But this is not the
11 100 year storm event, wind wise. It is just sort
12 of a husky afternoon sailing breeze. You can get
13 a 50 knot sully about every year, every other
14 year.

15 MS. ESPOSITO: We are supposed to
16 get 50 mile per hour winds tomorrow.

17 DR. BOHLEN: We might get 50 mile
18 per hour winds tomorrow, so there you are, call
19 me a liar. Again, any time you look at these
20 things, you sort of scale them out, what do they
21 look like, what do they feel like. Again, the
22 impressive thing about Sandy that made it
23 memorable was the surge, and the impressive thing
24 about Sandy that made it memorable was the surge
25 down towards New York. In this case, this is

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2 Kings Point, this is in Long Island Sound. In
3 Kings Point, there is a surge up here on the
4 order of 4 meters. We get down to the eastern
5 end of things, on the order of one and a half to
6 2 meters.

7 So we have a pretty good surge down
8 at our end. It has got a recurrence on the order
9 of 30 to 40 years sort of a thing. When you get
10 down to the western end of Long Island Sound and
11 New York Harbor, you have got a recurrence
12 interval of once every 1,000 years or so. That
13 is what got the attention, besides 8 million
14 people, to Sandy.

15 Superstorm Sandy, our analysis of
16 that, running it in, created higher maximum
17 amount of stresses in some areas, and most of
18 those areas were closer to shore, sitting in
19 here. If you ran this guy against the slide I
20 showed you earlier, which was the results of the
21 model that is running through every year, and no
22 Sandy in that, you won't see an awful lot of
23 difference. You will see some spatial variability in
24 areas where you would expect to see more reds up
25 along the shallows. It makes sense.

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2 Sandy was, for the most part, a
3 southeasterly storm here. It went northeasterly
4 as it got volume. Southeast, this way, east this
5 way. That's when you have got your good winds
6 and you have got some good waves and you have got
7 some good stresses acting against, you all know
8 what, residual flows. You stuff a lot of water
9 down at the western end of the Sound, and it has
10 got to go somewhere. It comes back out. It is
11 the interaction of the tidal wave with the
12 outflow of water that produces some interesting
13 turbulence, and increases the change in boundary
14 shear stress. So the picture here is fairly
15 complicated, but it didn't turn everything red at
16 all, is the model of this story. But I suppose
17 you could find me a higher energy storm. Start
18 looking around for it.

19 This is now the Superstorm Sandy
20 conditions, and again, you are running these up
21 against what we had before, and you see New
22 London along on the eastern Sound and Cornfield,
23 Six Mile. Six Mile is out in the water a little
24 bit more, a little bit higher. These numbers
25 aren't terribly much different than what we saw

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before. In fact, in some areas, you might see the stresses a little bit lower because of the complexity of the interaction of the flow.

We define a stress level based on historical data and literature. Based on a review, we chose point 75 Pascal as something of a designed threshold. You can make it higher, you can make it a little bit lower, you can sit and argue about it if this is a work in progress. But you have the data to progress, to do that sort of testing. The model is looking pretty good. The results of the model are impressive.

Critical shear stress, if you listened to what I told you before, the manner of setting up a critical shear stress for cohesive materials is complicated. It depends on grain sized fraction at play, volume fraction, how many burrowing organisms you have working that are sediment bound, how long the sediment has been down for consolidation. All of that affects bulk density, affects erodibility, and bulk density is very important in here.

The comparison of the maximum amount of stress for potential dredge material

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1
2 disposal site simulation in the three observing
3 Campaigns and Sandy, throwing in Sandy, came out
4 with this set of numbers. Cornfield one. Six
5 Mile is next. Fishers Island west. This is
6 south of Fishers Island near the deep hole was
7 next. Then Niantic Bay and Clinton Harbor. You
8 run down this guy, the New London disposal site
9 is point 69. All of these guys here; Block
10 Island, New London, Fishers Island Center,
11 Orient, Fishers Island East and North of Montauk
12 are less than the defined critical threshold,
13 point 75.

14 What this guy is, is just a schmear
15 of areas where the maximum amount of stress
16 exceeds point 75. To give you an idea that it
17 covers a fair number of the sites in the Eastern
18 Sound, it covers a fair number of sites in the
19 Eastern Sound, with the exception of the Fishers
20 Island site down here. This is the kind of
21 information that is coming in, that we often can
22 come into the site selection designation.

23 So sites one, two and seven,
24 Cornfield Shoals, Six Mile and Fishers Island.
25 Everybody knows where they are, and Fishers

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1
2 Island is west, have high maximum stress. Four
3 and ten, this is Orient Point and Block Island,
4 the Block Island Sound site. Maximum stress is
5 below at the center of the site, but have values
6 in excess of point 75 Pascals at the boundary.
7 So there is a spatial variation on the scale of a
8 mile or so. Grant already told you that the
9 resolution of the model might be on the order of
10 a quarter of a mile or so.

11 Sites three and five, Niantic Bay
12 and Clinton Harbor, maximum stresses, but less
13 than one. The stresses are above point 75, but
14 less than one. If you want to really hold me to
15 point 75, you can make your one, you can argue
16 about a quarter of a Dyne or so, a quarter of a
17 Pascal or so, the issue gets interesting. The
18 only disposal and the only site on the Eastern
19 Sound with a maximum stress level below point 75.
20 We saw that. Thank you. Questions?

21 DR. HAY: Before you have any
22 questions, state your name, please, for the
23 record, and also your affiliation.

24 MR. GASH: I am Bill Gash,
25 Connecticut Maritime Coalition. Referencing back

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2 to one of your earlier slides when you were
3 talking about shear out there, I have a letter
4 from the State of New York objecting to
5 consistency certification for dredge projects
6 taking place in Mystic.

7 I just want to be clear on
8 something. They state in their letter that
9 sediments associated with that project were
10 comprised almost entirely of fine grain, very
11 small silty particles. I would imagine those are
12 the same fines that you are talking about.

13 DR. BOHLEN: What fines?

14 MR. GASH: That all stick
15 together, they are all glued together.

16 DR. BOHLEN: Yes, yes.

17 MR. GASH: They said given the high
18 current velocities and unstable nature of
19 sediments at and in the vicinity of NFDS, and the
20 placement of the material from this proposal that
21 contains large volumes of that very fine silt,
22 adverse affects are anticipated at the site,
23 adjacent areas as a result of the dredge material
24 disposal activities. Can you comment on that at
25 all? From what I am seeing from your

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2 presentation with the Pascals and the disposals,
3 once the material has fallen, there is going to
4 be some dispersion as they are falling. But as
5 they get near bottom, everything pretty much
6 settles down to less than point 75 shear in
7 Pascals.

8 DR. BOHLEN: I really can't
9 comment on it because I don't have the sediment
10 data to look at. But seemingly the statement, at
11 least the first part of the statement that you
12 read, flies in the face of what I said about the
13 erodibility of the materials that are
14 progressively more cohesive. As you get down
15 into the silt range of sediments, below 63
16 microns, the sediment, a sediment mass is very,
17 very cohesive, and tends to get probably more
18 cohesive looking, more cohesive as you add more
19 clay particles.

20 The problem with any one of these
21 about diagrams is they show you a single grain
22 size. If I picked up that stuff out of my bucket
23 and I said we did sediment grabs, full on grabs
24 at each of the stations that we are doing CPD
25 casts at, it would be shmuck on the deck. It

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2 would be quite cohesive and clay like. When you
3 get an analysis, you find there is a range of
4 particle sizes. So you might say the mean grain
5 size is 50 microns. But you have got a lot of
6 stuff that is down to two, and you may have a
7 little bit of stuff, because we do the grain
8 size, distribution by mass, so a few big
9 particles can skew the mean a lot.

10 Most of the sediments that we are
11 familiar with in Mystic River are exceedingly
12 cohesive. This is all I can tell you. As far as
13 the barge goes, that is another whole story. 45
14 years had us dining on the New London disposal
15 site. The sea story in that is that this was
16 material that was being dredged from the Thames
17 River for the channel up to the submarine base,
18 the channel from the mouth of the river up to the
19 submarine base. If you look, it is being put
20 into dredge by clamshell dredge and put into
21 2,000 cubic yard hopper barges. The barge would
22 go out and they would open the bottom door and
23 down goes the stuff.

24 We would go down after a while, I
25 am not going into going down, but we would go

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2 down after a while for a swim. Any number of
3 pieces of that stuff on the bottom retained the
4 teeth marks from the clamshell bucket. When you
5 drop that stuff in the water, there is a gravity
6 flow. It goes down like a brick, vertically, and
7 it retains its cohesive character until lobsters
8 drill holes in it. That is another story.

9 DR. HAY: Any other comments, any
10 questions?

11 MS. PURNELL: Marguerite Purnell.

12 DR. HAY: Do you want to state your
13 affiliation.

14 MS. PURNELL: Fishers Isle. The
15 information that is presented today, is it on the
16 web site yet?

17 DR. BOHLEN: No.

18 MS. PURNELL: Will it be posted
19 on the web site as one of our presentations?

20 MS. BROCHI: It will, and when we
21 post information, we are going to send an E-mail
22 notification so everybody knows that it will be
23 available. Because there is just a lot of
24 material. I could ask you 40,000 questions and
25 it is not really fair to the other people who are

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2 here.

3 DR. BOHLEN: You could try one.

4 MS. BROCHI: She already asked
5 one.6 DR. BOHLEN: That is okay. She
7 can ask one other question.8 MS. PURNELL: I appreciate the
9 physical oceanography component to it, and there
10 is a lot of meat in there to really think about.
11 Have you made any effort to correlate that with
12 the prior physical oceanography that was done in
13 the prior designation for western Long Island
14 Sound and Central Long Island Sound since there
15 were data points in the Eastern Long Island Sound
16 for the site feasibility as well. I was just
17 wondering whether or not you have looked at the
18 consistency of the data and the findings as of
19 yet.20 DR. BOHLEN: I am not exactly
21 sure what you are asking. Because as I showed
22 you, I think, you are going to expect a fair
23 amount of difference in the transporter regime in
24 the central and western Sound, where we have
25 worked before, but not on the siting study. Me,

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2 not on the siting study.

3 I have worked on other parts of the
4 Sound, so there is a significant difference in
5 the transport system in the Central Sound,
6 Western Sound versus the Eastern Sound.

7 MS. PURNELL: I concur.

8 DR. BOHLEN: You can believe it
9 just from an energetic standpoint, you saw all of
10 those arrows, the blue arrows, the white arrows
11 we showed you on the model. Then of course there
12 is the matter of it being open to the world ocean
13 out there from the southeast. It is a much more
14 energetic system. The comparison between the two
15 I am not so sure is germane to this question.

16 MS. PURNELL: The comparison is
17 germane in the sense that there was a large chunk
18 of data in the physical oceanography report that
19 dealt with the Eastern Long Island Sound. I
20 apologize if that did not come across in my
21 question.

22 DR. BOHLEN: Anything that dealt
23 with the Eastern Long Island Sound we have seen.
24 Of course, the other thing is we did the report
25 that is in the Long Island Sound volume on the

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physical oceanography of Long Island Sound. We saw some of the slides from that report up here. So we are looking at all of that, and that will all be brought together. I think the thing that is impressive on this from the standpoint, again, from the history of disposal in the Sound is you have got more site specific measurements in this study than you had in any other study already.

There are seven frames out there, and the effort to tie all that together, and verify, calibrate and redesign the model has been substantial, leaving you with a very powerful tool to be used for any use out there, really. It is a substantial foundation to resolve the issue.

MS. PURNELL: The data point that was closest to the New London dump site, you based some of your findings on that. Where is that related to the position of the current outline of the dump site? Is it in it or is it to the northwest or is it to the southwest? Given the resolution of the slide, it is hard to figure.

DR. BOHLEN: Why don't we look

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2 on here as to exactly where it is. I will put
3 the slide up and show you.

4 DR. MCCARDELL: I should add that
5 the seven sites that we used for the surveys were
6 chosen to represent the maximum variability that
7 we would see within this entire domain as an
8 attempt to get the model as good as we could.
9 They were not chosen to represent any specific
10 site, because we are legislated to be able to
11 consider all possible sites. If we give undue
12 credence to one site, we would have measurements
13 at one site and not others.

14 MS. PURNELL: Thank you.

15 DR. MCCARDELL: I hope that
16 explains a little bit.

17 MS. PURNELL: Thank you.

18 DR. HAY: Thank you. Other
19 questions?

20 MR. MCALLISTER: Kevin McAllister,
21 Defend H2O. That was very thorough. Thank you,
22 Doctor. Forgive me if I am missing something,
23 but this component with this oceanography, we are
24 really focusing on dispersal, the biological
25 implications as defined, I guess, at least in

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2 part with the environmental consequences. Was
3 that another part? Am I missing something?

4 DR. BOHLEN: No biology.

5 MR. MCALLISTER: No biology. Of
6 course, certainly I understand that part, but
7 where is the biology?

8 MS. BROCHI: This is one part of
9 the site screening. This is the physio component.
10 There is a biological component as well.
11 Biological characterization will be done combined
12 with this physio model to model sediment transport
13 as well.

14 MR. MCALLISTER: Will you be back
15 in town to share this information with us?

16 MS. BROCHI: We will share the
17 information, but we don't know the dates. Again,
18 whenever anything is posted on the web site, we
19 will notify you ahead of time. While this physio
20 presentation is fresh in your mind, we will have
21 it available probably next week. We will send
22 out notification and have the presentation up, so
23 yes. It is a multi faceted process, so it has
24 many components going on, and we have contractors
25 putting it together as we speak.

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2 MR. MCALLISTER: As I understand,
3 if I am not mistaken, was it the environmental
4 consequences document that seems to be the bulk
5 of the biology? That is at least what I saw so
6 far as being represented. Is that correct?

7 MS. BROCHI: I am not sure what
8 you mean by "environmental consequences."

9 DR. HAY: Do you mean the SEIS,
10 the Supplemental Environmental Impact Study?

11 MR. MCALLISTER: No, there was
12 another document that I had viewed, environmental
13 consequences document.

14 MS. BROCHI: I am not familiar
15 with the environmental consequences document, but
16 if you remember it or you can reference it, send
17 an E-mail to any of us, actually, or ELIS@EPA.gov
18 e-mail, and we can get back to you.

19 DR. HAY: The environmental
20 consequences document will be part of the SEIS.

21 MR. MCALLISTER: Chapter five,
22 environmental consequences.

23 MS. BROCHI: All right. I
24 thought you were looking at something.

25 MR. MCALLISTER: Thank you.

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2 MS. BROCHI: There is also a no
3 action alternative as part of this effort. So it
4 is looking at sites, but is also looking at what
5 happens if there is no site.

6 DR. HAY: Okay then. Other
7 questions, comments?

8 DR. BOHLEN: We are pretty easy
9 to find. BOHLEN@UCONN.EDU, or you can just take
10 a look at the University of Connecticut and see
11 the faces in here. If there are questions, we
12 are happy to answer them.

13 MR. MCALLISTER: May I make a
14 request with respect to our sign in? Would it be
15 possible to provide some contact information to
16 the attendees here via E-mail?

17 MS. BROCHI: Sure.

18 MR. MCALLISTER: Because a couple
19 of those slides that were identified went by very
20 quickly.

21 DR. BOHLEN: I'm sorry, a couple
22 of the slides --

23 MR. MCALLISTER: A couple of the
24 slides that identified the presenters and who was
25 being represented today, that went very quickly.

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2 I didn't get names and contact information.

3 MS. BROCHI: Sure, we will get
4 that out. We will do that in the notification
5 when we post the information on the web site.

6 MR. MCALLISTER: Thank you.

7 DR. HAY: The names of the
8 presenters is also on the agenda.

9 A SPEAKER: Just an anonymous
10 question. Who is responding to these requests?

11 MS. BROCHI: Several of us at the
12 Region 1 office.

13 DR. HAY: Thank you. Other
14 questions?

15 MS. ESPOSITO: Adrienne Esposito,
16 Citizens Campaign for the Environment. Just for
17 clarity, the University of Connecticut is
18 contracted out by the EPA to do this work?

19 DR. BOHLEN: No.

20 MS. BROCHI: They are contracted
21 for the project, and the contract is through
22 Connecticut University, and contracted through
23 the EPA.

24 MS. ESPOSITO: Okay, but
25 contracted for this project.

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2 MS. BROCHI: Yes.

3 MS. ESPOSITO: I understand.

4 DR. BOHLEN: You heard about a
5 whole bunch of other things, and we may or may
6 not involved in those.

7 DR. HAY: Other questions? Going
8 once, twice? Last chance? I will adjourn the
9 meeting now.

10 (TIME NOTED: 4:25 P.M.)

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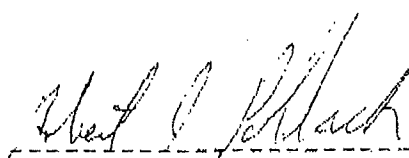
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CERTIFICATION

I, Robert J. Pollack, a Notary
Public in and for the State of New
York, do hereby certify:

THAT the foregoing is a true and
accurate transcript of my stenographic
notes.

IN WITNESS WHEREOF, I have
hereunto set my hand this 13th day of
December 2014.

A handwritten signature in cursive script, appearing to read "Robert J. Pollack", is written over a horizontal dashed line.

ROBERT J. POLLACK

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